



Improving Access to Water Information: NWIS Web Services Snapshot for ArcGIS

Sally Holl

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Austin, Texas**

<http://txpub.usgs.gov/snapshot>

Outline

- Objectives
- Overview: NWIS & NWISWeb
- The Challenge
- The Solution
- Use Cases
- The Future
- Where to get the software and source code

“A wonderfully useful USGS tool”

THE CHANNEL RESTORATIONIST

Information and tools for those involved with stream and river restoration



« Free AGU Geophysical Monograph on Stream Restoration

Making volunteer monitoring data available to a larger audience »

Wonderfully useful USGS tool

July 30, 2012 by Bill McDavitt

Since about 1997 or so, I've been looking at USGS daily flow data. I also started using ESRI's GIS software around that time as well. Despite being released last December, I just found out about this tool only a few days ago. Now that I've given it a spin, I am very impressed. ESRI's latest version of ArcGIS (version 10) and the USGS NWIS Snapshot tool are perfect companions.

Here's a link to the 2 page summary of the USGS tool: <http://pubs.usgs.gov/fs/2011/3141/>

“The Snapshot tool is one of the easiest to learn tools that I’ve seen...”

*- Ipswich Community Watershed Volunteer,
7-30-2012*

Start with Science

Maps, Imagery, and Publications

Hazards

Newsroom

Education

Jobs

Partnerships

Library

About USGS

Social Media


How do we make smart decisions about
a changing world?

Start with Science

There are 7 billion people on Earth, and that number is increasing every day — human influence on our planet is ever more apparent. Changes to the natural world combined with growing human demands threaten our health and safety, our national security, our economy and our quality of life.

Help shape the future of USGS science!

Offer your comments on our draft strategies.

The USGS is focused on some of the most significant issues society faces, in which natural science can make a substantial contribution to the well-being of the Nation and the world. The USGS Science Strategy outlines the major societal issues that USGS science is poised to address. Now we're creating specific strategies for each of those areas to expand and advance the actions we can take in the next decade, and we need your help. 

Core Science Systems

Climate and
Land Use Change

Energy and Minerals

Environmental Health

Ecosystems

Natural Hazards

Water



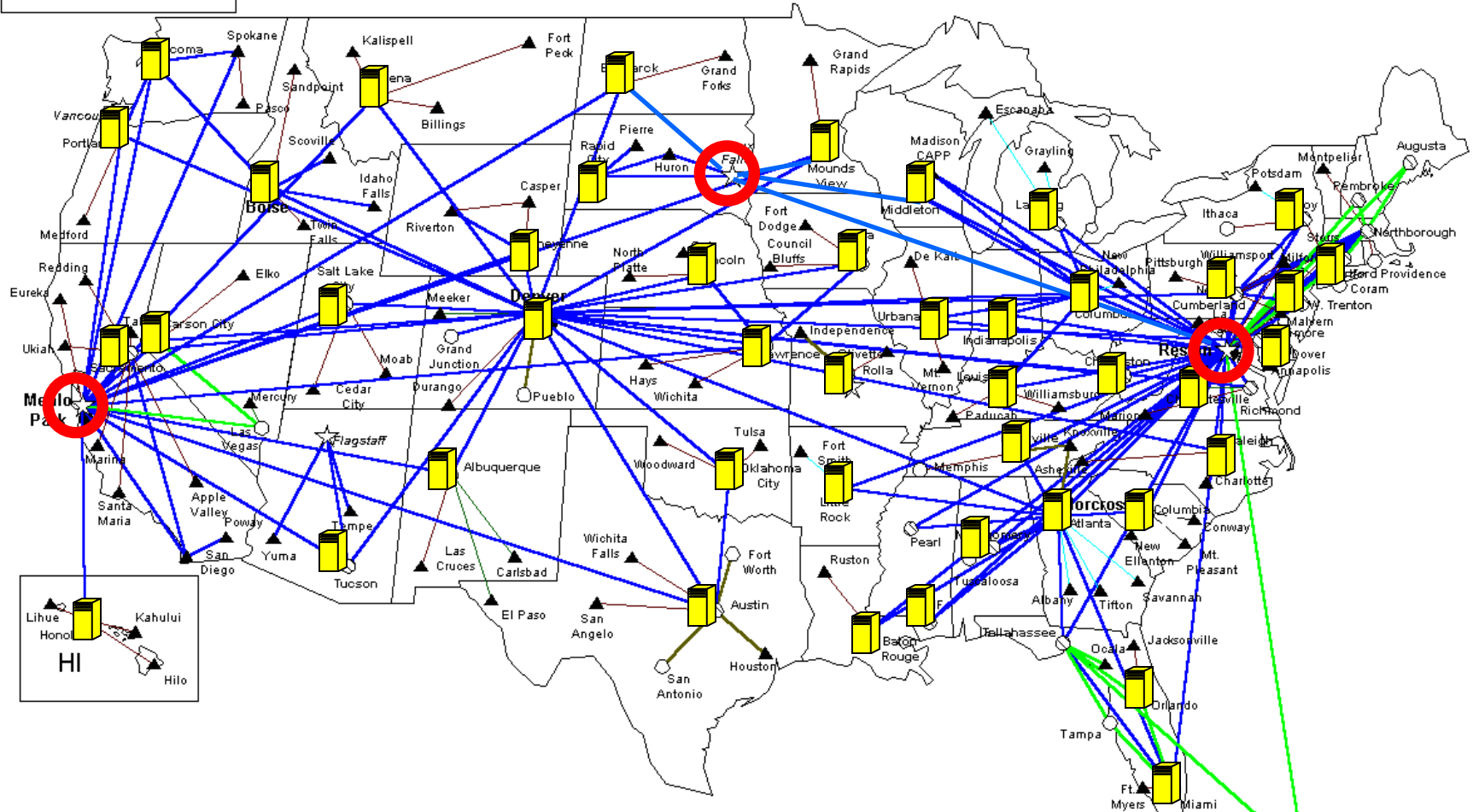
USGS **C**ommunity for **D**ata **I**ntegration

- A dynamic community of practice working together to advance **scientific data and information management and integration capabilities** in the USGS
- *<https://my.usgs.gov/confluence/display/cdi/>*
- Working groups
 - Citizen Science, Data Management, Semantic Web, Mobile Applications, Cloud Computing, + more

National Water Information System (NWIS)

- Ground-Water Site-Inventory System (GWSI)
- Automated Data Processing System (ADAPS)
(time series database)
- Water-Quality System (QWDATA)
- Water Use Subsystems (SWUDS, AWUDS)
- Device Conversion and Delivery System (DECODES)
- Project Networks

NWIS Network



-- NWIS Installation



-- NWISWeb Web Server Node

USGS Water Data for the Nation

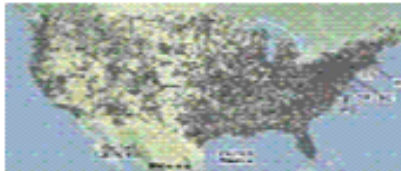
Search for Sites With Data

Current Conditions

Sites with real-time or recent surface-water, groundwater, or water-quality data.

Site Information

Descriptive site information for all sites with links to all available water data for individual sites.



Map of all sites with links to all available water data for individual sites.

Frequent Searches By Data Category

Surface Water

Water flow and levels in streams and lakes.

Groundwater

Water levels in wells.

Water Quality

Chemical and physical data for streams, lakes, springs, wells and other sites.

Internal Access Only See this section.

[NWIS]

[Question](#)
[Feedback](#)
[Automated](#)
[Help](#)

National Water Information System (NWIS):

The “**gold standard**” for water information

<http://waterdata.usgs.gov/>

NWISWeb – What is it?

- Provides access to select USGS data
 - Real-time data
 - Site information
 - Current and historical
 - Streamflow
 - Daily means
 - Daily, monthly, and annual statistics
 - Peak flows
 - Field Measurements including channel geometry
 - Ground-water levels
 - Water-quality
- Does not include all data stored in NWIS

<http://waterdata.usgs.gov/>

What is *not* included in NWISWeb?

USGS 11455760 SUISUN BAY NR CONCORD NAVAL WEAPONS STATION

Available

Stream Site

DESCRIPTION:

Latitude 38°03'52", Longitude 122°05'00"
Solano County, California, Hydrologic Unit 18050001
Datum of gage: 0. feet above sea level NGVD29.

AVAILABLE DATA:

There are no data available online for this site.

Contact the state office (below) to inquire about the availability of other data for this site.

OPERATION:

Record for this site is maintained by the USGS California Water Science Center

Email questions about this site to [California Water Science Center Water-Data
Inquiries](#)



USGS Water Data for the Nation (NWISWeb) Database

	Sites	Values
Total	1,555,979	Bazillions
Instantaneous values	12,846	358,000,000
Daily values	35,010	325,000,000
Ground-water levels	840,535	8,660,000
Water Quality samples	381,917	5,024,000
Water Quality values	381,917	94,251,000
Peaks	27,943	720,000

The Quality

Downloading and Preprocessing NWIS Water Quality Data Working Notes from North Dakota Example March 2009

1. <http://nwis.waterdata.usgs.gov/usa/nwis/nwis> - Home page is only place with "Help" button that explains codes and parameters (fields with numbers) - sort of - really weak.
2. Go to Water Quality, select state in upper right corner and hit go - gives you count of available data for that state after each tab.
3. Choose "Field/Lab Samples. Takes you to just pull data by state unless you submit something.
4. Since chemistry tables are large, I had state). Used Lat-Long option to do this.
5. Middle section of page pertains only at the bottom of page to download the

Choose Output Format Display Summary of Selected S Choose one of the following of criteria above:

- ☒ Table of sites sorted by
- ☒ Scroll list of sites -- a'
- ☒ Brief descriptions --

Inventory of water-quality data For printing ... button

Tab-separated inventory of water-quality data Save to file

Tab-separated data One result per row

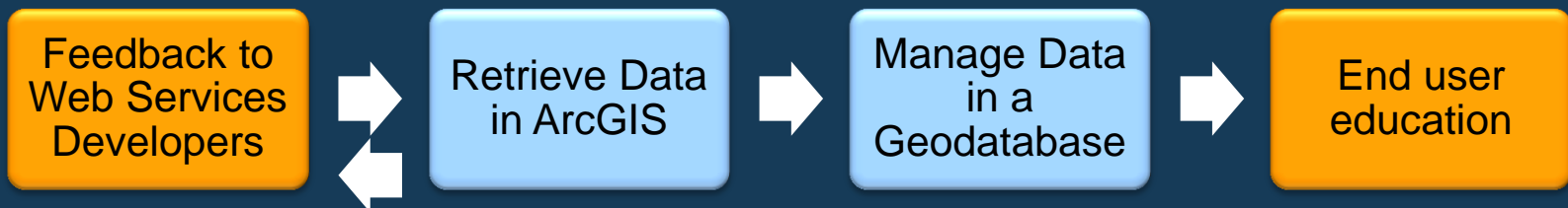
Default attri

7. Use Access to preprocess ascii data dumped from NWIS.
 - Used Textpad to cut headers from ascii files
 - Open blank database, Tables, Import, select tab file, next to specify using first row as headers, then hit "Advanced" button on bottom left. Make sure "Site_no" is a text field since it's the primary link/key, check other field types and set accordingly.
 - Go to Queries - select "New - Design View" and add appropriate table.
 - Can use New query - Find Duplicates - to make a table of desired parameter values (LUT)
 - Add fields to bottom area, use expressions to change headings in top area, and criteria to select specific values. Link the LUT to limit file to the desired params.
 - Go to top Query menu (which only shows up in design view) and select Crosstab Query.
 - Hit the Summation icon to get Total row to show up (need to Group field)
 - Add expression to replace qualified values:
`VALUE: Max(IIf([remark_cd]="M",-999,IIf([remark_cd]="E",-888,IIf([remark_cd]="<",[result_va]*-1,IIf([remark_cd]=">",-777,[result_va])))))`
 - In Crosstab row - fields that you want as column headings --- put as Row Heading, Column Heading = PCODE, and Value is the value field.
 - To save to a table, have to start a new "Make File" query. Add crosstabl qry to this query, pull all fields down by dragging the "*", then hit the red exclamation on top tool bar to make a new table.
 - BEST JUST TO OPEN MY Access db for ND to see examples.
`C:\DATA\MGoldhaber\NWISWeb_ND_March09\ND_WtrQual_NWIS_Access.mdb`

The Solution:

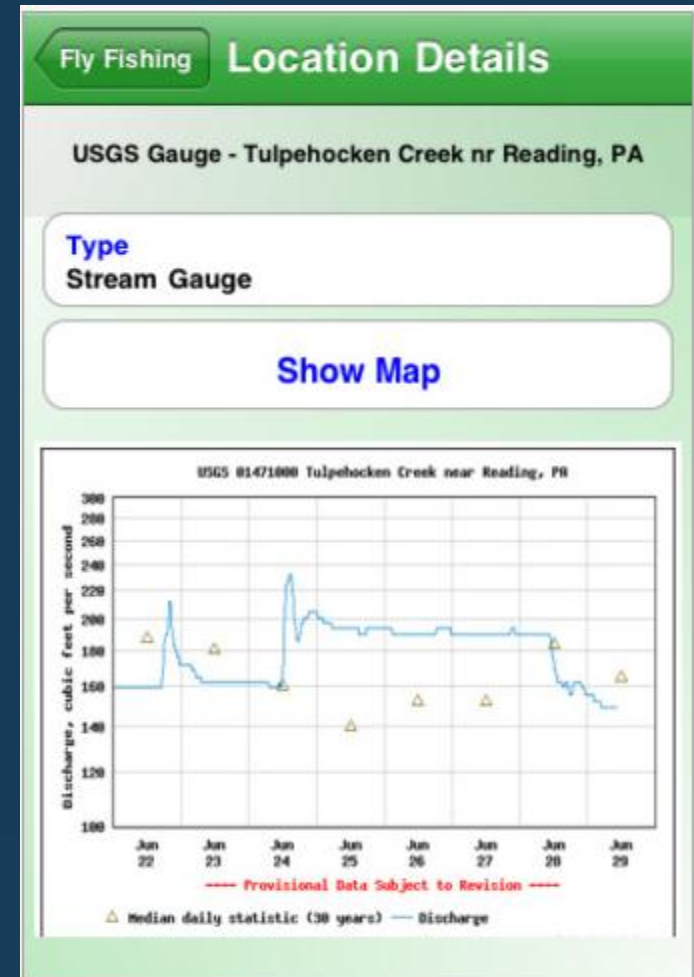
NWIS Web Services Snapshot

- **Retrieves and manages** data from USGS NWIS Water Services
- Streamlines **data retrieval** and **management** for ArcMap users
- **Educates** end users on the NWIS database
- Serves as an example of a custom app that uses USGS web services – use our code (<http://github.com/usgs>) or build your own!



Web Services

- We now have web services
- Allows one machine to talk to another
- Retrieve data more frequently
 - Instantaneous values
 - Daily values
 - Site data
 - Water-quality
- Ideal for custom built applications



USGS Water Data for the Nation

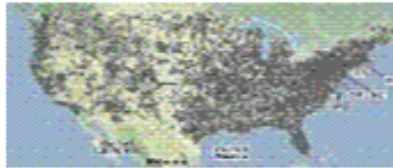
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In the
bottom left
corner of
almost every

Frequent Searches By Data Category

http://waterdata.usgs.gov/nwis/news/?automated_retrieval_info

Groundwater

Water levels in wells.

Water Quality

Chemical and physical data for streams, lakes, springs, wells and other sites.

Internal Access Only See this section.

[\[NWISWeb Manual\]](#) [\[News\]](#) [\[FAQ\]](#) [\[NWIS-RT Home\]](#)

[Questions about sites/data?](#)

[Feedback on this web site](#)

[Automated retrievals](#)

[Help](#)

Send your programmer
here to get started



Water Services

USGS Water Services - Windows Internet Explorer

http://waterservices.usgs.gov/

USGS Home
Contact USGS
Search USGS

USGS Water Services

Home REST Web Services SOAP Web Services Documentation Examples Links

Water Service Shortcuts

- Instantaneous Values Service for real-time data and historical data since October 1, 2007
- Site Service
- Daily Values Service
- Water Quality Service
- Frequently Asked Questions
- Writing Fault-Resistant Code

Service Example

This example uses a USGS water web service, as well as [AJAX](#), [JSON](#) and [jQuery](#) Web 2.0 technologies.

USGS Site No. 01646500
[Find sites](#)

Get Latest Streamflow
Reset

Tips

Join the USGS Water Data Notification Service

While all USGS water web services strive to be highly available and accurate, there may be occasional system issues that may impact one or more services. In addition, older versions of the service

USGS Water Services

This site serves [USGS water data](#) via automated means using [web services](#) and [extensible markup language \(XML\)](#) as well as other popular media types. Services can be invoked with the [REST](#) protocol. These services designed for high fault tolerance and very high availability. You will find this site very useful if you to periodically acquire and process USGS water data.

Water Services News

March 2012 - Groundwater Levels Web Service and many service improvements
01 Mar 2011 15:00:00 GMT

- New features
 - New Site service features. The [Site service](#) offers three important new minor filters:
 - Ability to search by USGS parameter code (parameterCd). For example, you could find all sites that serve water temperature data in degrees Celsius using the argument `¶meterCd=00010`.
 - Ability to search by data collection start date, end date or a period of time from now. Sites selected will include sites where any data were collected during a date range that you specify.
 - Ability to locate sites by national aquifer or local aquifer.
 - New Instantaneous Values service features:
 - Expanded period of data available for Instantaneous Values service. The [Instantaneous Values web service](#) now

Service Highlights

USGS Instantaneous Values Web Service

Need current data? Try this service! Retrieve current streamflow and other real-time data for one or multiple sites, using sets of flexible, predefined filters, since October 1, 2007. Data are available in [WaterML](#), [JSON](#) and in a tab-delimited format with more formats, like Microsoft Excel, to come. [Learn more about the web service](#) or [test the web service](#).

USGS Site Service

Need USGS water site data? A [rich new site service](#) is now available as a production service. The service allows searches for USGS sites and site information using a variety of flexible filters. A [test tool](#) is also available. Output formats include tab-delimited and KML formats (used with Google Earth and Google Maps). Geography Markup Language (GML) is planned for a future release.

USGS Daily Values Service

Interested in historical summarized daily data about

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<http://waterservices.usgs.gov/>

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USGS Water Services - Windows Internet Explorer

http://waterservices.usgs.gov/

USGS Home Contact USGS Search USGS

USGS Water Services

Home REST Web Services SOAP Web Services Documentation Examples Links

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Local intranet | Protected Mode: Off

<http://waterservices.usgs.gov/>

Water Services



The screenshot shows the USGS Water Services website in a Windows Internet Explorer browser window. The address bar displays <http://waterservices.usgs.gov/>. The page features the USGS logo and navigation links for Home, REST Web Services, SOAP Web Services, Documentation, Examples, and Links. The main content area is divided into several sections: Water Service Shortcuts, USGS Water Services (with a description of the site's capabilities and a photo of a person in a field), Service Highlights (including USGS Instantaneous Values Web Service and USGS Site Service), Water Services News (with a headline about March 2012 updates), and USGS Daily Values Service. The USGS Instantaneous Values Web Service section describes the service's ability to retrieve current streamflow and other real-time data for one or multiple sites, using sets of flexible, predefined filters, since October 1, 2007. The USGS Site Service section describes the service's ability to search for USGS sites and site information using a variety of flexible filters. The USGS Daily Values Service section describes the service's ability to retrieve historical summarized daily data about streamflow and other real-time data for one or multiple sites, using sets of flexible, predefined filters, since October 1, 2007. The USGS Site Service section describes the service's ability to search for USGS sites and site information using a variety of flexible filters. The USGS Daily Values Service section describes the service's ability to retrieve historical summarized daily data about streamflow and other real-time data for one or multiple sites, using sets of flexible, predefined filters, since October 1, 2007.

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USGS Daily Values Service

Interested in historical summarized daily data about

USGS Daily Values Service

Interested in historical summarized daily data about our nation's streams, lakes and wells? This service provides a wealth of historical water data. Daily data available for USGS water sites include mean, median, maximum, minimum, and/or other derived values. [Learn more](#) and [test the service](#).

<http://waterservices.usgs.gov/>

Water-Quality Web Services

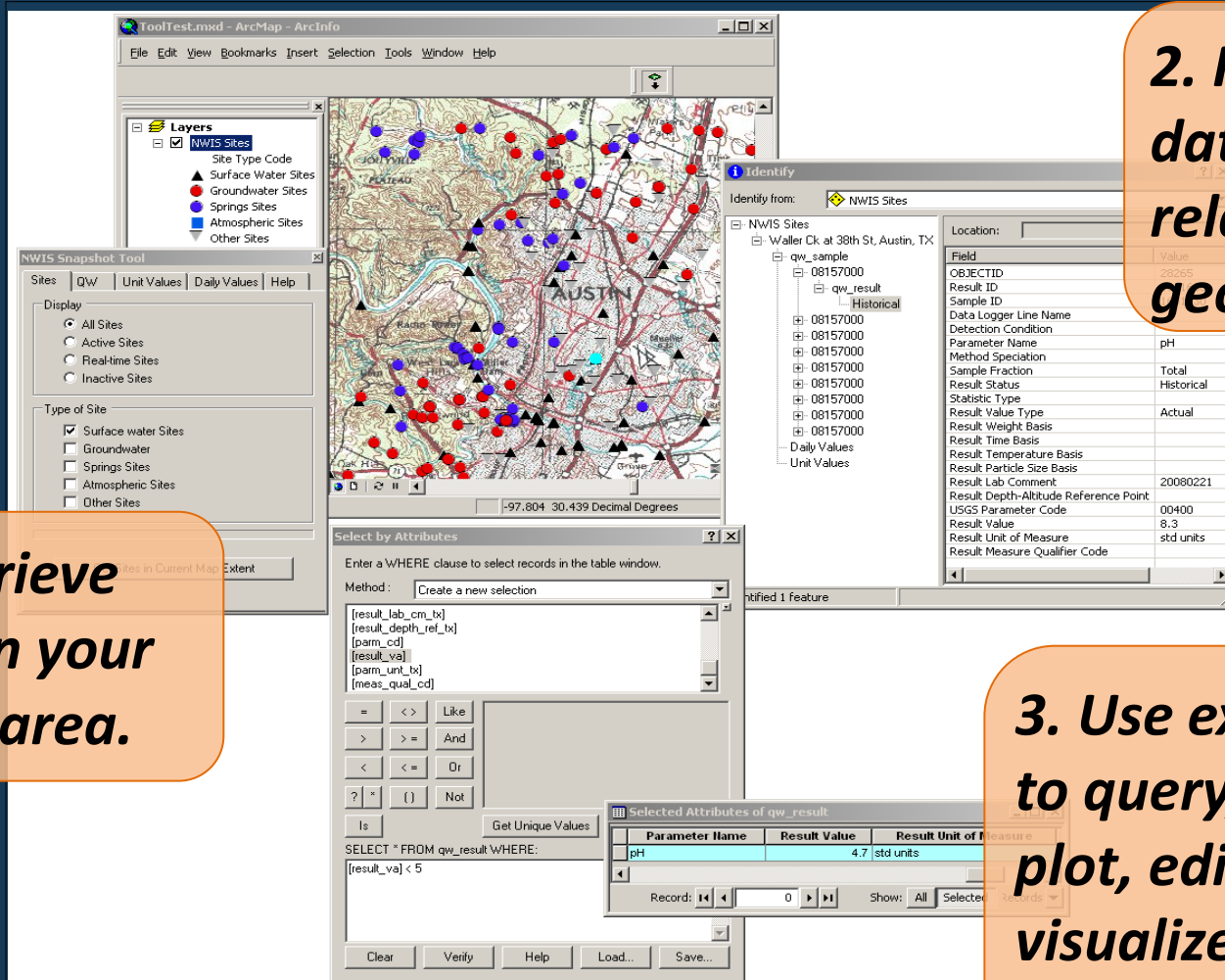
- Download USGS and EPA data
- Compatible formats
- Most of the formatting has been done
- Still need to merge the files
- Released in April 2012

Water Quality Portal

<http://www.waterqualitydata.us/>

NWIS Web Services Snapshot

1. Retrieve sites in your study area.



2. Retrieve data to a relational geodatabase.

3. Use existing tools to query, analyze, plot, edit, expand, visualize, and export NWIS data.

System & Skill Requirements: Users

- Microsoft .NET Framework version 3.5
- ESRI ArcMap10.0
- Internet connection
- Assumes user is familiar with Microsoft Windows and ArcMap.

System Requirements: Developers

Minimum system requirements for working with the Snapshot source code:

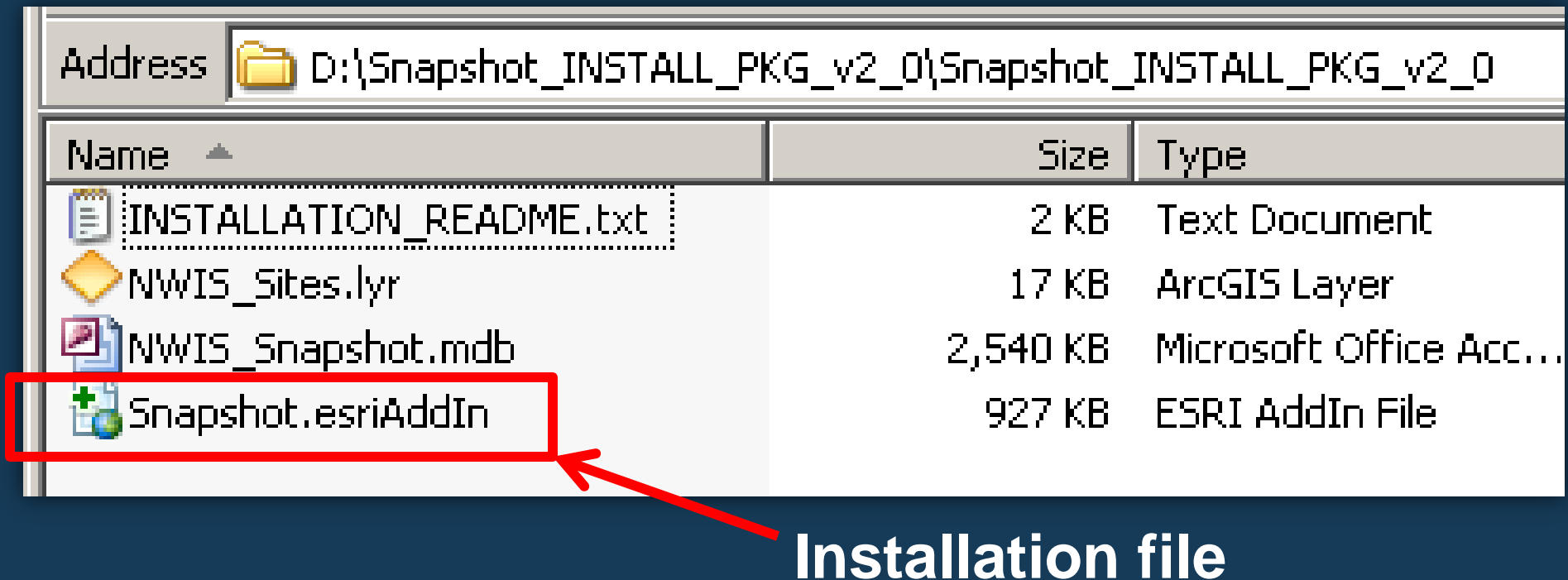
- Microsoft Visual Studio 2010
- .NET Framework 3.5
- ESRI ArcMap 10


Additional recommended resources (not required):





- ESRI SDK for ArcMap 10

Installation

- Retrieve the install package from <http://txpub.usgs.gov/snapshot>



Address  D:\Snapshot_INSTALL_PKG_v2_0\Snapshot_INSTALL_PKG_v2_0

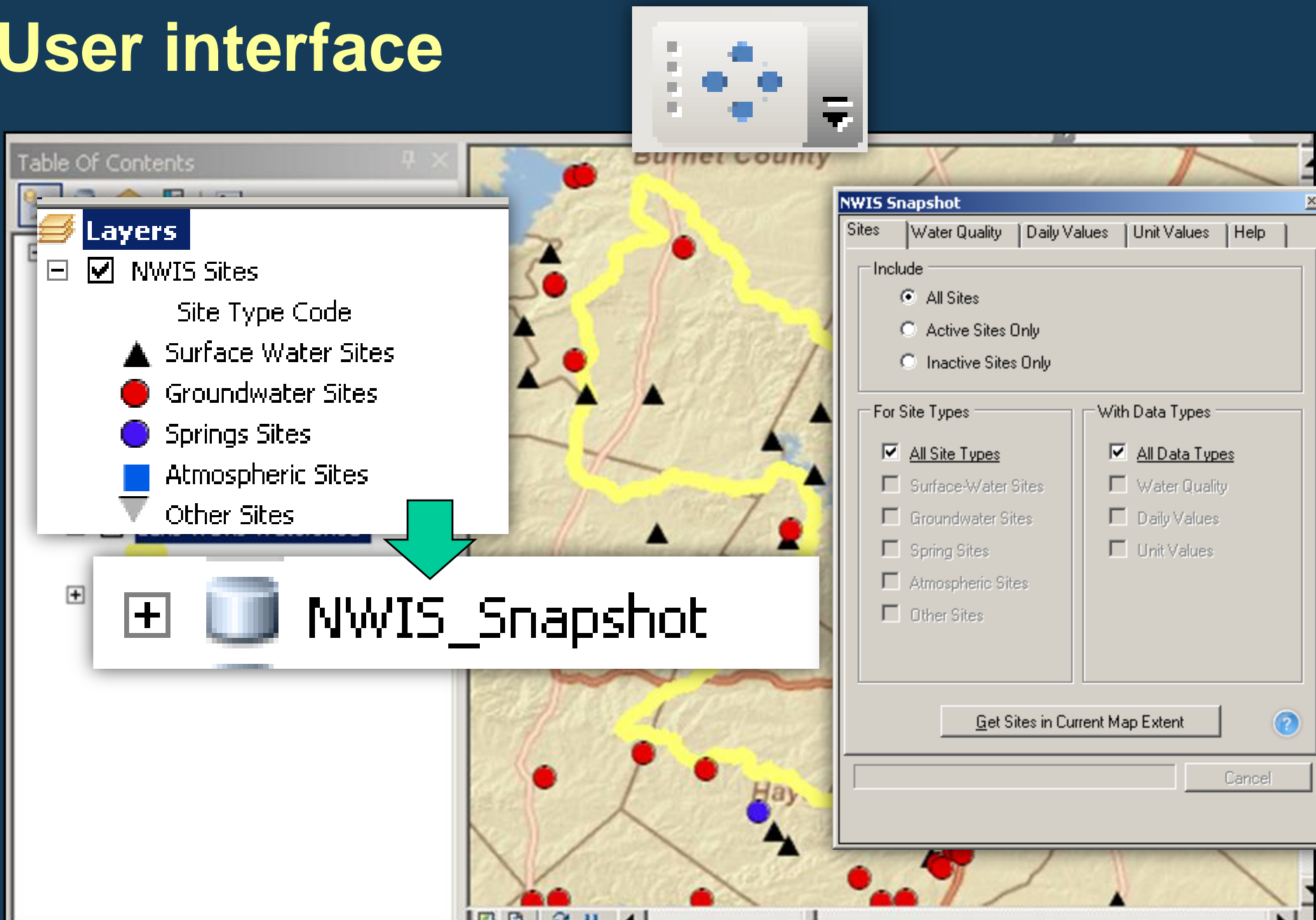
Name	Size	Type
 INSTALLATION_README.txt	2 KB	Text Document
 NWIS_Sites.lyr	17 KB	ArcGIS Layer
 NWIS_Snapshot.mdb	2,540 KB	Microsoft Office Acc...
 Snapshot.esriAddIn	927 KB	ESRI AddIn File

Installation file

Installation

1. Save and unzip the installation .zip file anywhere on your computer
 2. Double click the .esriAddIn installation file
* **System administrator rights are not needed**
 3. Add the NWIS_Sites.lyr file to ArcMap and connect it to the sitefile feature class
- **Enterprise install option** on a shared network drive through the Add-In Manager

User interface



*Populated by queries to
<http://www.waterqualitydata.us>*

Site Information

sitefile	
FK1,FK2,FK3,I1	SITENO
	STNAME AGENCY SITE_TP_CD LAT LNG NWISWEB

WQ Samples

qw_sample	
I2	SITENO
FK1,I1	record_no_xml site_no_xml samp_type_nm medium_nm medium_sub_nm sample_start_dt sample_start_time sample_start_tz sample_end_dt samp_rel_depth_nm samp_depth_ref_tx project_cd coll_ent_nm sample_cm_tx aqfr_nm hyd_cond_nm hyd_event_nm result_count

WQ Results

qw_result	
I1	record_no_xml
	parm_cd dat_log_ln_nm remark_nm parm_alias_nm result_meth_spec_nm parm_frac_tx dqi_name parm_stat_tx result_val_tp parm_wt_tx parm_tm_tx parm_temp_tx parm_size_tx result_lab_cm_tx result_depth_ref_tx result_va parm_unt_tx meas_qual_cd

Instantaneous Values

uv_result	
I1	siteno
	xml_param xml_date_and_time xml_qualifiers xml_value

Daily Values

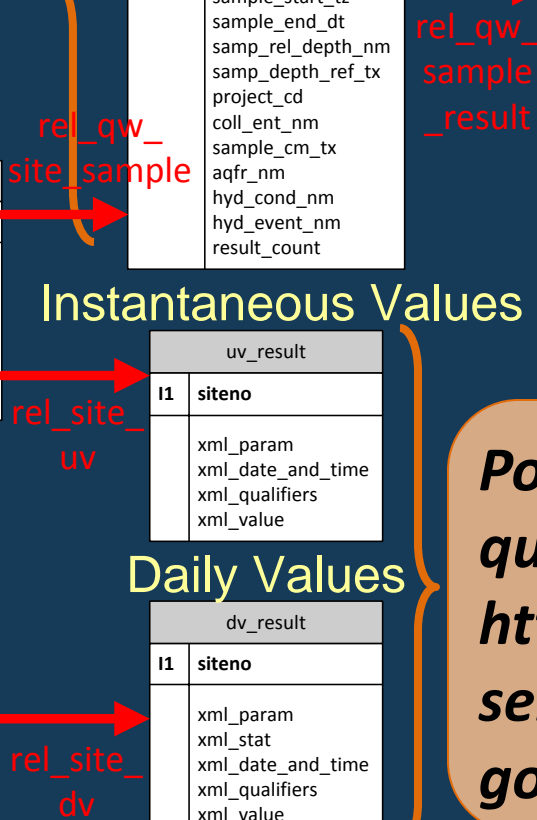
dv_result	
I1	siteno
	xml_param xml_stat xml_date_and_time xml_qualifiers xml_value

Data Request Log

Snapshot_DL_Date	
	OBJECTID
	Snapshot_Query Snapshot_Date

Geodatabase Design

*Populated by
queries to
<http://water.services.usgs.gov>*



Water Quality Code Selection Tool

NWIS Snapshot

Sites **Water Quality** Daily Values Unit Values Help

Site Selection

☐ Request Data for All Sites

☒ Request Data for Selected Sites

Parameter Codes

00400

Selection Tool

Top Ten

☐ All Parameter Codes

Count: 1

Date Range

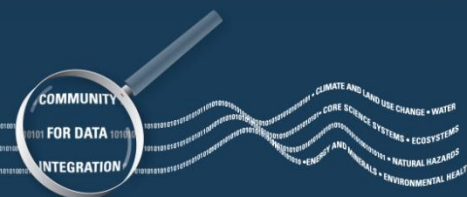
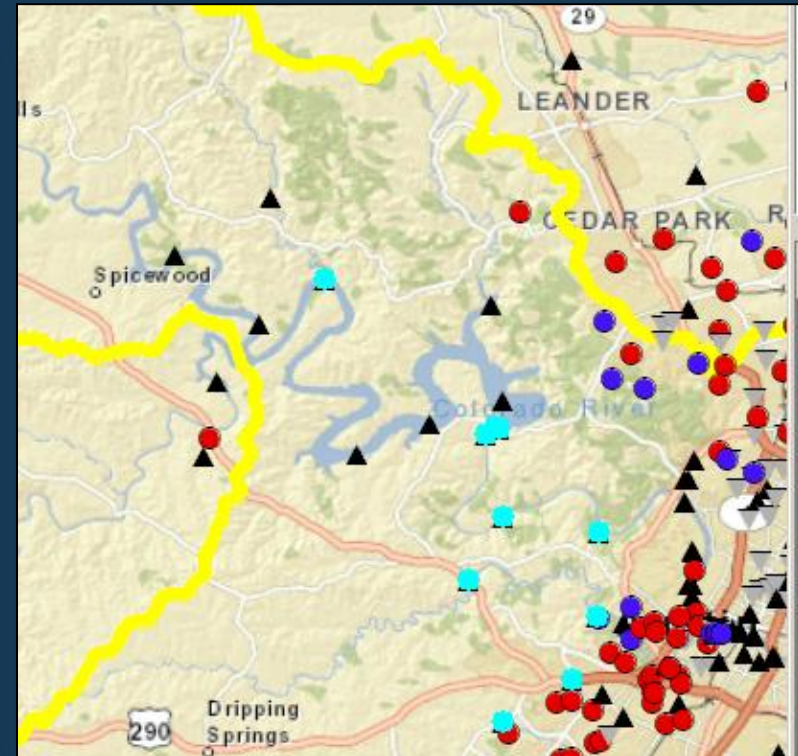
Start Date End Date

6/ 4/2012 6/ 6/2012

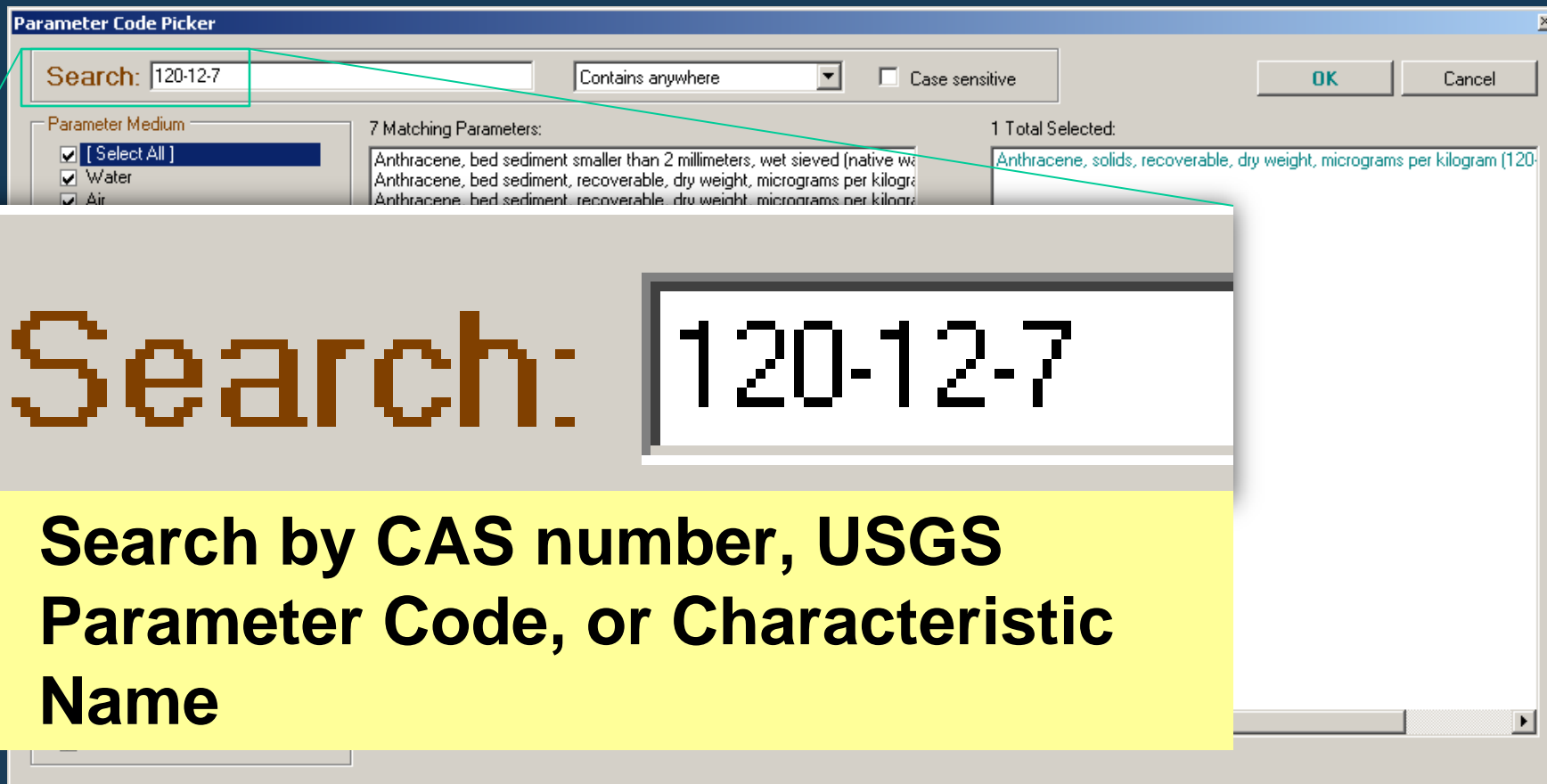
☐ All Available for Period of Record

Get Water Quality Data

?



Water Quality Code Selection Tool



The screenshot shows the 'Parameter Code Picker' window. The search field contains '120-12-7'. The search criteria are set to 'Contains anywhere' and 'Case sensitive' is unchecked. The 'Parameter Medium' section has checkboxes for '[Select All]', 'Water', and 'Air'. The '7 Matching Parameters' list includes three entries for Anthracene. The '1 Total Selected' list shows 'Anthracene, solids, recoverable, dry weight, micrograms per kilogram (120-12-7)'. A large graphic below the screenshot shows the search term '120-12-7' in a pixelated font.

Parameter Code Picker

Search: 120-12-7 Contains anywhere ☐ Case sensitive

OK Cancel

Parameter Medium

- ☒ [Select All]
- ☒ Water
- ☒ Air

7 Matching Parameters:

- Anthracene, bed sediment smaller than 2 millimeters, wet sieved (native wa
- Anthracene, bed sediment, recoverable, dry weight, micrograms per kilogra
- Anthracene, bed sediment, recoverable, dry weight, micrograms per kilogra

1 Total Selected:

- Anthracene, solids, recoverable, dry weight, micrograms per kilogram (120-12-7)

Search: 120-12-7

Search by CAS number, USGS
Parameter Code, or Characteristic
Name

Water Quality Code Selection Tool

The screenshot shows the 'Parameter Code Picker' window. The search bar contains '120-12-7' and the dropdown menu is set to 'Contains anywhere'. A list of 7 matching parameters is shown, and one parameter is selected. A dropdown menu overlay is positioned in front of the main window, listing the available search criteria: 'Contains anywhere' (highlighted), 'Contains as complete word', 'Starts with', and 'Regular expression (advanced)'.

Parameter Code Picker

Search: 120-12-7 Contains anywhere Case sensitive

OK Cancel

Parameter Medium

- ☒ [Select All]
- ☒ Water
- ☒ Air
- ☒ Biological Tissue
- ☒ Sediment
- ☒ Soil
- ☒ Other
- ☒ Unspecified

Parameter Group

- ☒ [Select All]
- ☒ Information
- ☒ Physical
- ☒ Inorganics, Major, Metals
- ☒ Inorganics, Minor, Metals
- ☒ Inorganics, Major, Non-metals
- ☒ Inorganics, Minor, Non-metals
- ☒ Organics, Pesticide
- ☒ Organics, PCBs
- ☒ Organics, Other
- ☒ Nutrient
- ☒ Microbiological
- ☒ Biological
- ☒ Radiochemical
- ☒ Stable Isotopes
- ☒ Sediment

7 Matching Parameters:

- Anthracene, bed sediment smaller than 2 millimeters, wet sieved (native w...
- Anthracene, bed sediment, recoverable, dry weight, micrograms per kilogr...
- Anthracene, bed sediment, recoverable, dry weight, micrograms per kilogr...
- Anthracene, soil, recoverable, dry weight, milligrams per kilogram (120-12-7)
- Anthracene, suspended sediment, recoverable, micrograms per liter (120-12-7)
- Anthracene, water, filtered, recoverable, micrograms per liter (120-12-7 34)
- Anthracene, water, unfiltered, recoverable, micrograms per liter (120-12-7 34)

1 Total Selected:

- Anthracene, solids, recoverable, dry weight, micrograms per kilogram (120-12-7 34)

Contains anywhere

Contains anywhere

Contains as complete word

Starts with

Regular expression (advanced)

The Snapshot Workflow

1. Interface options determine URL for querying web service

2. Web service returns XML data stream of matching results

3. XML is parsed, geodatabase populated, and map refreshed

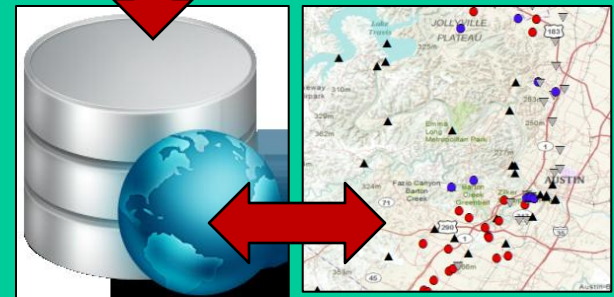
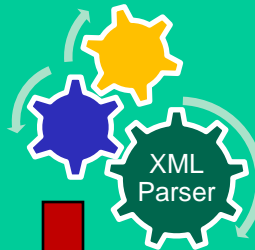
The screenshot shows the 'NWIS Snapshot' web application. It has a top navigation bar with tabs: 'Sites', 'Water Quality', 'Daily Values', 'Unit Values', and 'Help'. The 'Sites' tab is active. Below the tabs, there are two main sections: 'Include' and 'For Site Types'. The 'Include' section has three radio buttons: 'All Sites' (selected), 'Active Sites Only', and 'Inactive Sites Only'. The 'For Site Types' section has two columns of checkboxes. The first column, 'For Site Types', includes 'All Site Types' (checked), 'Surface-Water Sites', 'Groundwater Sites', 'Spring Sites', 'Atmospheric Sites', and 'Other Sites'. The second column, 'With Data Types', includes 'All Data Types' (checked), 'Water Quality', 'Daily Values', and 'Unit Values'. At the bottom, there is a button 'Get Sites in Current Map Extent' and a 'Cancel' button.

```
<?xml version="1.0" encoding="UTF-8" ?>
<mapper>
  <sites>
    <site sno="02479965" sna="BIG CREEK" />
    <site sno="02479960" sna="LONGHOR" />
    <site sno="02479975" sna="LITTLE JAS" />
    <site sno="02479975" sna="COLD RUN" />
    <site sno="02479975" sna="BULL MOO" />
  </sites>
</mapper>
```

WEB SERVICE

waterservices.usgs.gov

<http://waterservices.usgs.gov/nwis/site?format=mapper,1.0&bBox=83.0,36.5,81.0,38.5&siteStatus=active..>



Geodatabase ↔ Sites Layer Linking

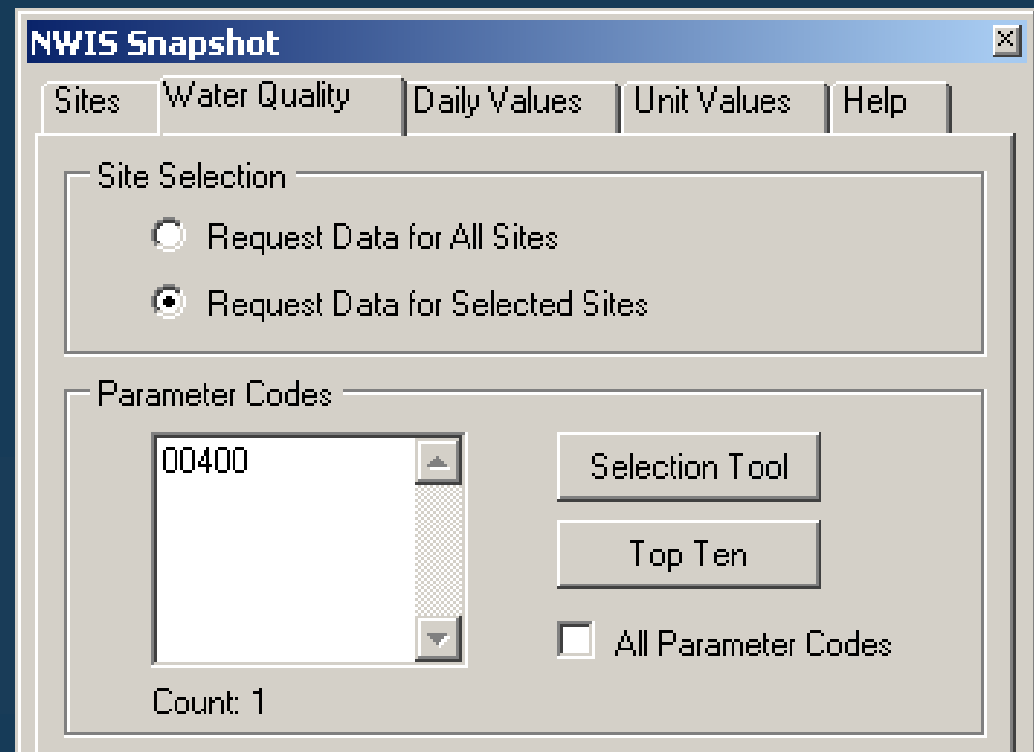
Requesting data from a web service

<http://www.waterqualitydata.us/Result/search?siteid=USGS-06832500&pCode=00400&mimeType=xml>

The screenshot shows the 'NWIS Snapshot' web application. It has a blue title bar and a navigation menu with tabs: 'Sites', 'Water Quality', 'Daily Values', 'Unit Values', and 'Help'. The 'Water Quality' tab is selected. The main content area is divided into two sections. The 'Site Selection' section contains two radio buttons: 'Request Data for All Sites' (unselected) and 'Request Data for Selected Sites' (selected). The 'Parameter Codes' section features a list box containing '00400', a 'Selection Tool' button, a 'Top Ten' button, and an unchecked checkbox labeled 'All Parameter Codes'. At the bottom left of this section, it says 'Count: 1'. A small vertical banner on the right edge of the window contains the text: 'WATER USE CHANGE • WATER SYSTEMS • ECOSYSTEMS • NATURAL HAZARDS • ENVIRONMENTAL HEALTH'.

Requesting data from a web service

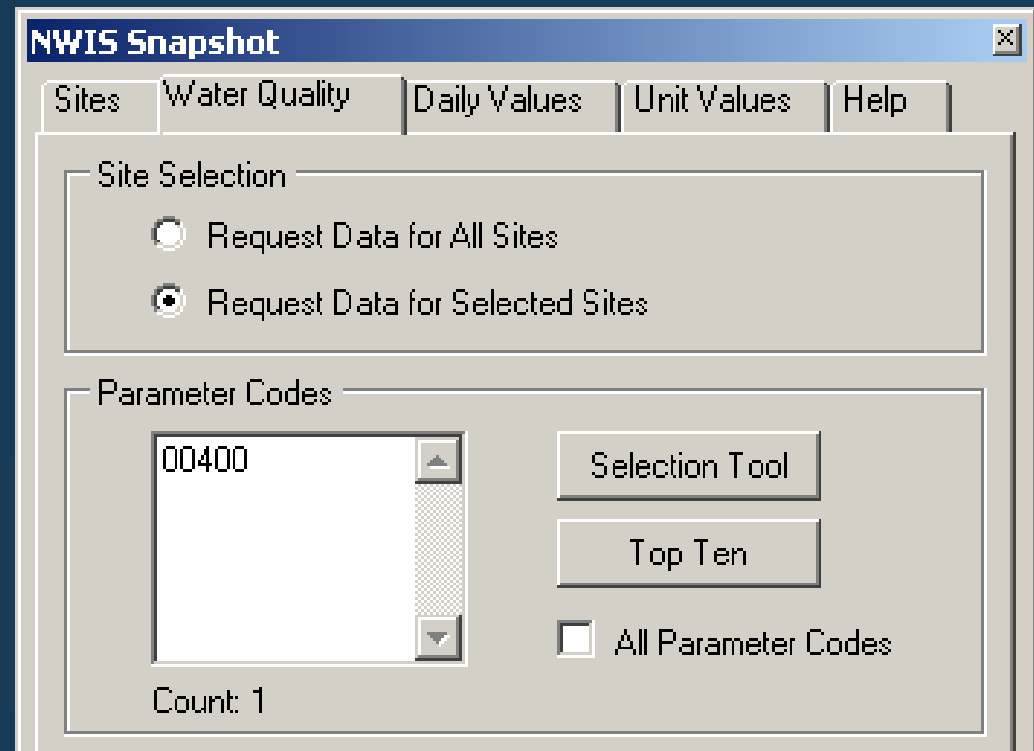
<http://www.waterqualitydata.us/Result/search?siteid=USGS-06832500&pCode=00400&mimeType=xml>



The screenshot shows the 'NWIS Snapshot' web application interface. It features a navigation bar with tabs: 'Sites', 'Water Quality', 'Daily Values', 'Unit Values', and 'Help'. The 'Water Quality' tab is currently selected. Below the navigation bar, there are two main sections. The first section, 'Site Selection', contains two radio buttons: 'Request Data for All Sites' (which is unselected) and 'Request Data for Selected Sites' (which is selected). The second section, 'Parameter Codes', contains a list box with the value '00400' and a 'Count: 1' label below it. To the right of the list box are two buttons: 'Selection Tool' and 'Top Ten'. Below these buttons is a checkbox labeled 'All Parameter Codes' which is currently unchecked.

Requesting data from a web service

<http://www.waterqualitydata.us/Result/search?siteid=USGS-06832500&pCode=00400&mimeType=xml>



The screenshot shows the 'NWIS Snapshot' web application interface. It features a tabbed menu at the top with 'Sites', 'Water Quality', 'Daily Values', 'Unit Values', and 'Help'. The 'Water Quality' tab is selected. Below the tabs, there are two main sections: 'Site Selection' and 'Parameter Codes'. In the 'Site Selection' section, there are two radio buttons: 'Request Data for All Sites' (unselected) and 'Request Data for Selected Sites' (selected). In the 'Parameter Codes' section, there is a list box containing '00400'. To the right of the list box are two buttons: 'Selection Tool' and 'Top Ten'. Below the list box, there is a checkbox labeled 'All Parameter Codes' which is currently unchecked. At the bottom left of the 'Parameter Codes' section, it says 'Count: 1'.

</MethodIdentifierContext>**USGS**</MethodIdentifierContext>

<MethodName>**USGS**</MethodName>

</SampleCollectionMethod>

<SampleCollectionEquipmentName>**Unkn**

</SampleDescription>

- <Result>

- <ResultDescription>

<CharacteristicName>**pH**</CharacteristicName>

<ResultSampleFractionText>**Total**</ResultSampleFractionText>

- <ResultMeasure>

<ResultMeasureValue>**8.2**</ResultMeasureValue>

<MeasureUnitCode>**std units**</MeasureUnitCode>

</ResultMeasure>

<ResultStatusIdentifier>**Historical**</ResultStatusIdentifier>

<ResultValueTypeName>**Actual**</ResultValueTypeName>

<ResultCommentText>**field**</ResultCommentText>

<USGSPCode>**00400**</USGSPCode>

</ResultDescription>

</Result>

</Activity>

- <Activity>

- <ActivityDescription>

<ActivityIdentifier>**readdneInc.01.99200655**</ActivityIdentifier>

XML (WQX)

Identify from:

<Top-most layer>

NWIS Sites

Lk Travis at Arkansas Bend nr Lakeway, TX

Austin, TX

sfield Dam, Austin, TX

Parameter Name

pH

Result Depth-Altitude Reference Point

Result Lab Comment

field

Result Measure Qualifier Code

Result Particle Size Basis

Result Status

Historical

Result Temperature Basis

Result Time Basis

Result Unit of Measure

std units

Result Value

7.7

Result Value Type

Actual

Result Weight Basis

Sample Fraction

Total

Statistic Type

USGS Parameter Code

00400

Value

sun1ast.01.98201343

1215

pH

Reference Point

field

ode

Historical

std units

7.7

Actual

Total

00400

Result Value

Result Value Type

Result Weight Basis

Sample Fraction

Statistic Type

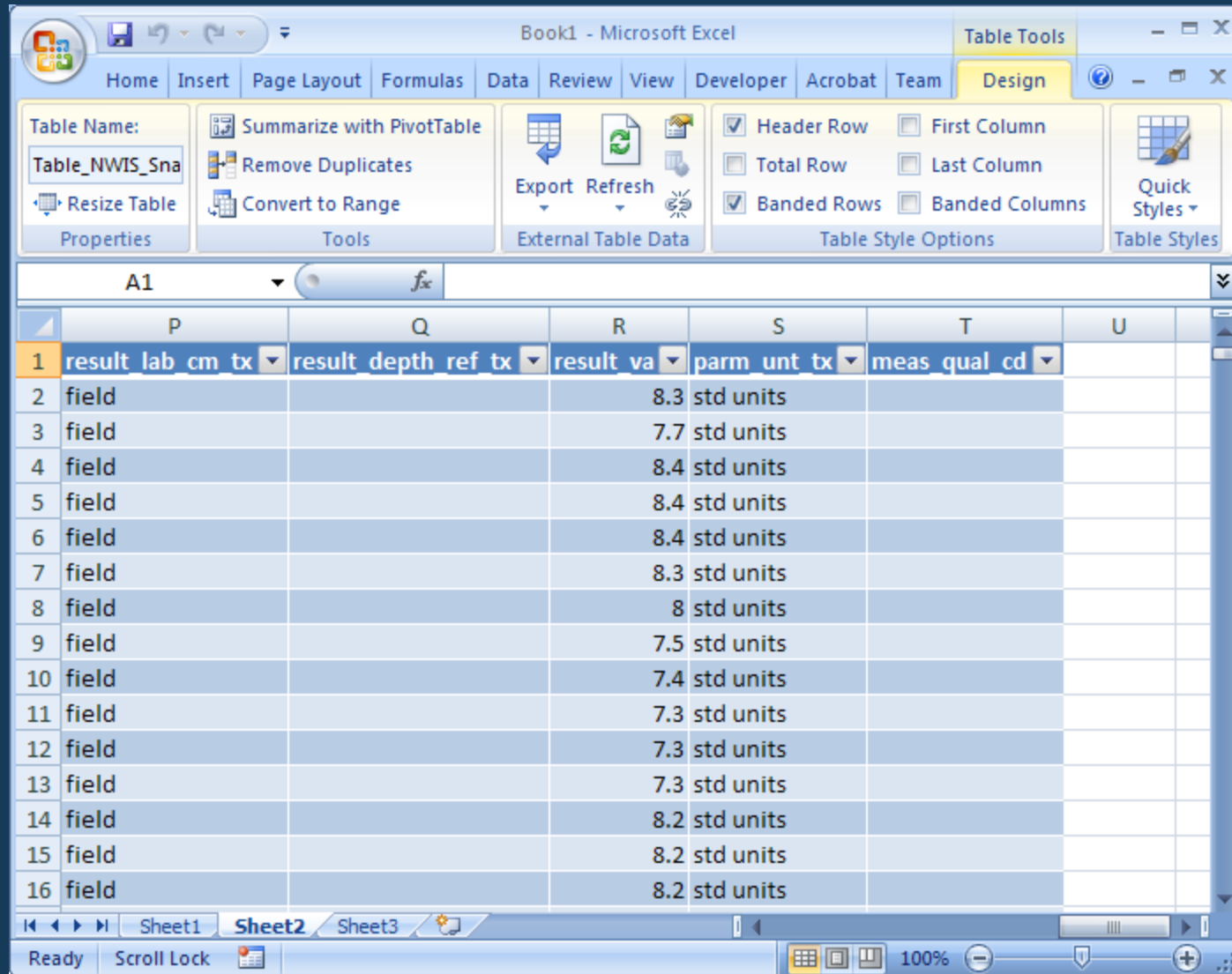
USGS Parameter Code

Identified 7 features

Demonstration

- Retrieving site information and daily values
 - <http://txpub.usgs.gov/snapshot/Video/NHPSiteDV.swf>
- Retrieving and querying water quality information
 - <http://txpub.usgs.gov/snapshot/Video/NHPWaterQuality.swf>
- Animating gage data
 - <http://txpub.usgs.gov/snapshot/video/NHPAnimation.swf>

Geodatabase is useable in Excel, Access, R, & Matlab



Book1 - Microsoft Excel

Table Name: Table_NWIS_Sna

Table Style Options

	P	Q	R	S	T	U
1	result lab cm tx	result depth ref tx	result va	parm unt tx	meas qual cd	
2	field		8.3	std units		
3	field		7.7	std units		
4	field		8.4	std units		
5	field		8.4	std units		
6	field		8.4	std units		
7	field		8.3	std units		
8	field		8	std units		
9	field		7.5	std units		
10	field		7.4	std units		
11	field		7.3	std units		
12	field		7.3	std units		
13	field		7.3	std units		
14	field		8.2	std units		
15	field		8.2	std units		
16	field		8.2	std units		

Ready Scroll Lock 100%

FY12: Public Release

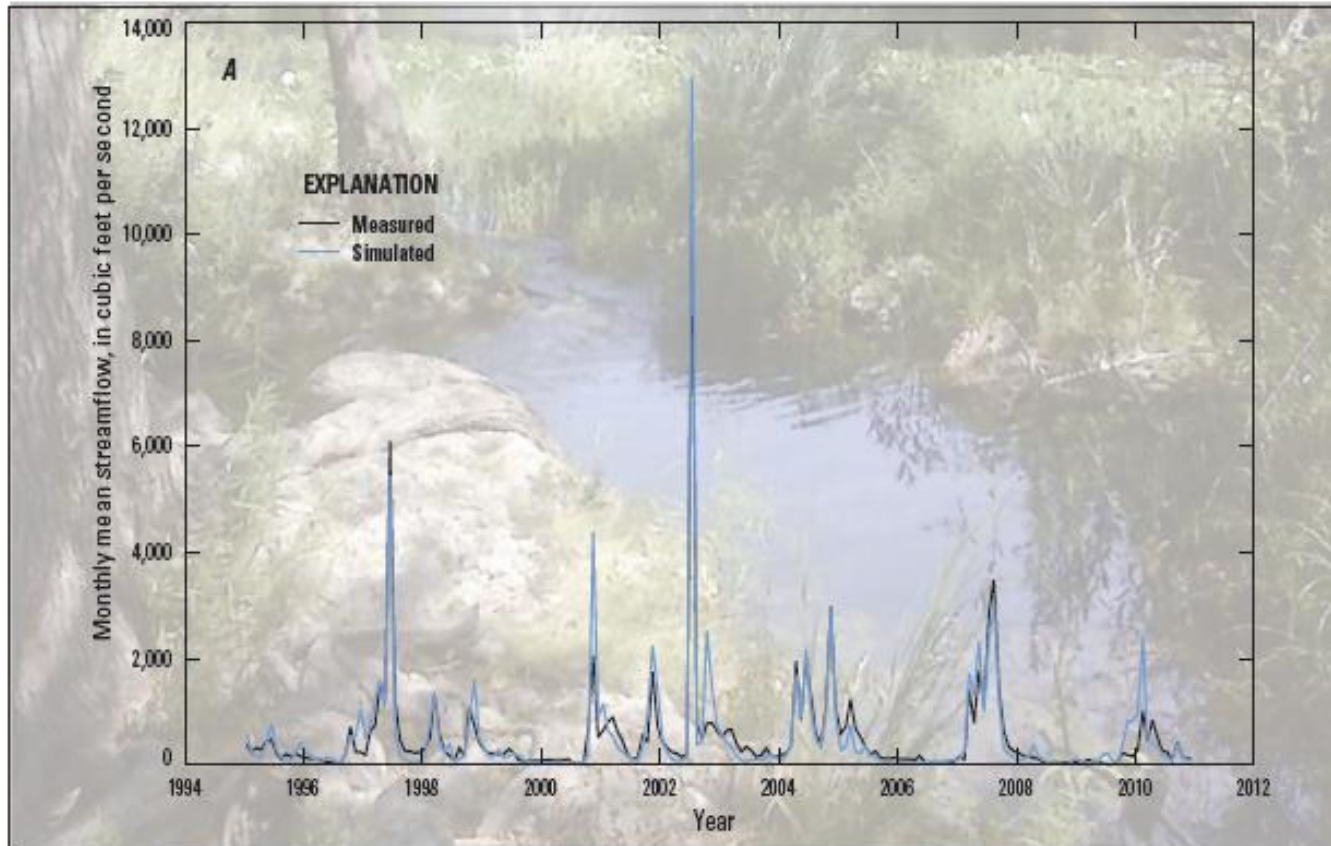
- Education
 - UT Austin “GIS in Water Resources”
 - ACC GIS Course
- Citizen Science
 - Ipswich community watershed group
- USGS Projects
 - SPARROW model validation in the Gulf region
 - High Plains groundwater flow model
 - Upper Guadalupe brush management



User Story: Modelling the Effects of Brush Management

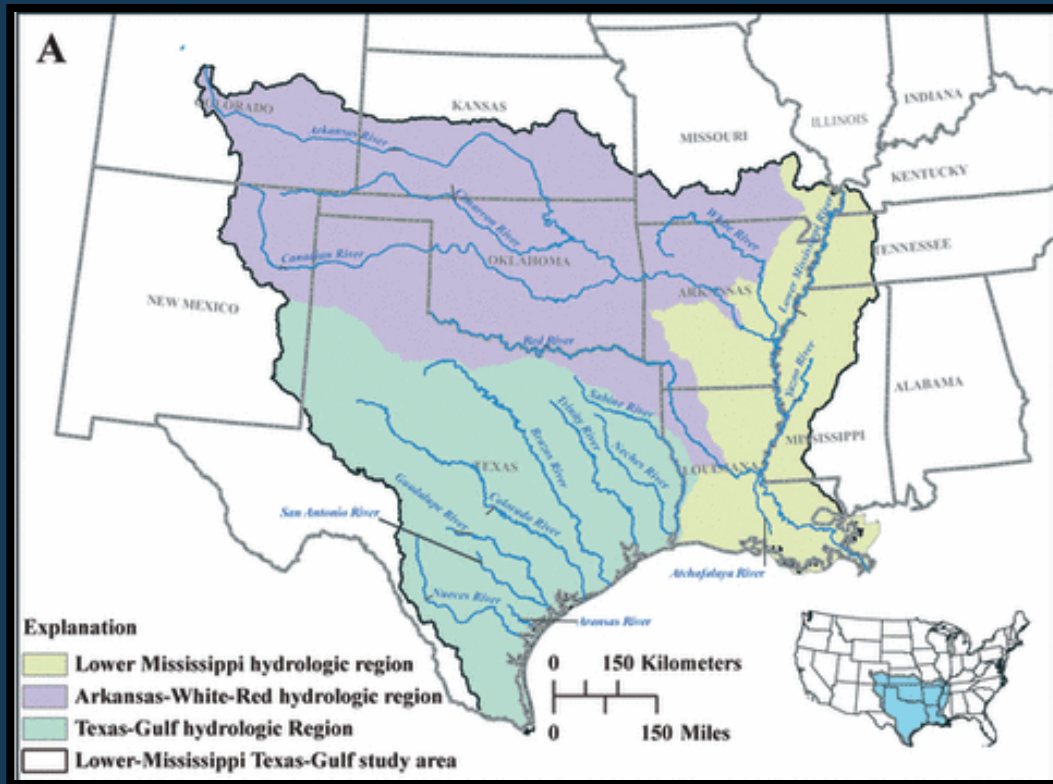
The Snapshot Tool enabled rapid retrieval of 15 years of daily streamflow measured at a gage along the upper Guadalupe River. The measured streamflow was used to calibrate a Soil Water Assessment Tool (SWAT) model of the watershed. Resource managers are using the study

results to guide brush management practices for the purpose of increasing water yields (*Bumgarner and Thompson, 2012*).



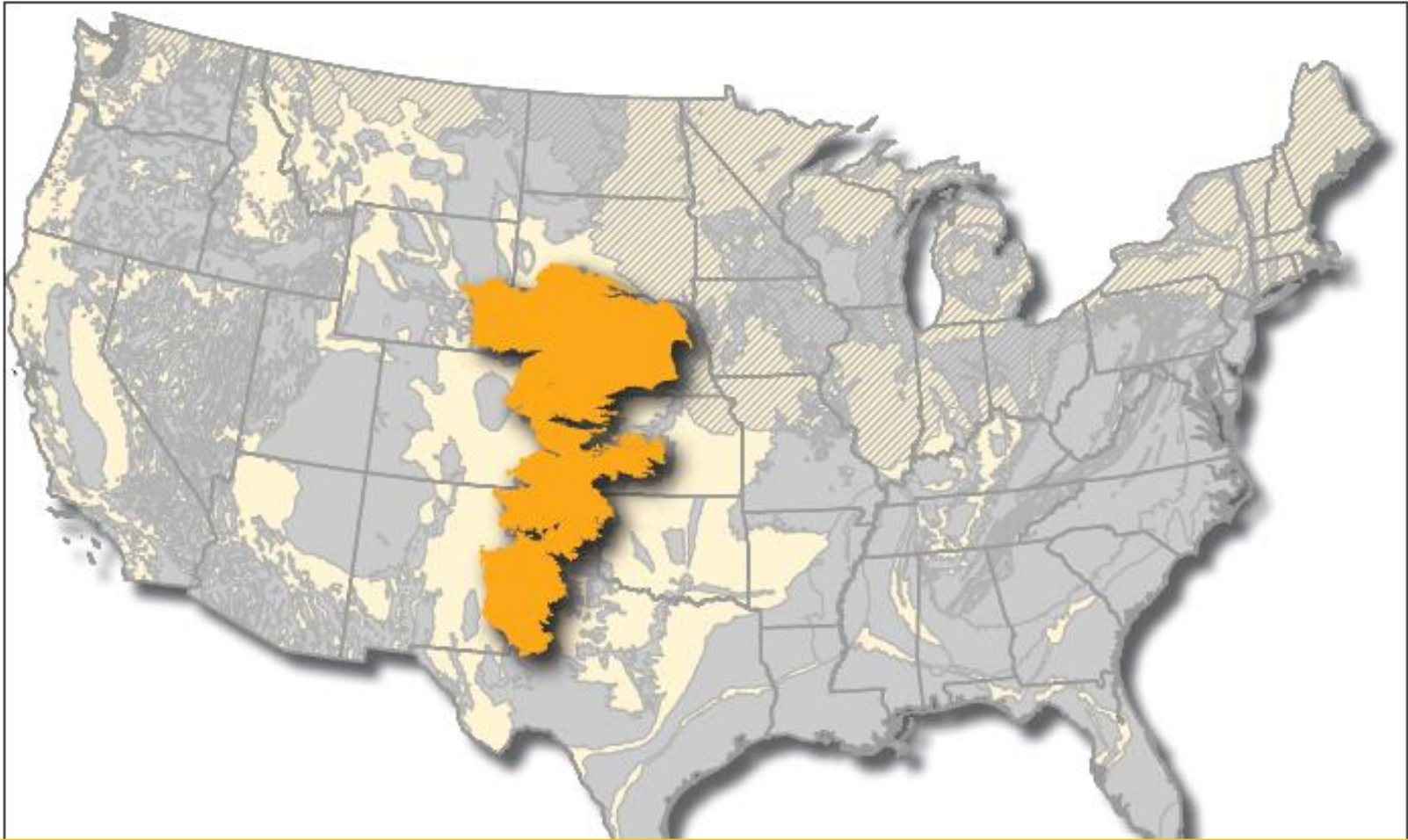
Bumgarner, J.R., and Thompson, F.E., 2012, *Simulation of streamflow and the effects of brush management on water yields in the upper Guadalupe River watershed, south-central Texas, 1995–2010*: **USGS SIR 2012–5051**, 25 p.

Water quality data for SPARROW model validation



- Major River Basin (MRB) region 5
- Prediction of nutrient loads and yields to the Gulf of Mexico in monitored and unmonitored streams

User Story: Quantifying Groundwater Availability



Daily groundwater levels from NWIS augmented the *High Plains Aquifer Water-Level Monitoring Study* data. Selected levels are being used to calibrate the Northern High Plains Aquifer groundwater flow model (<http://txpub.usgs.gov/HPWA>).

The Future

- Use the new
USGS
Groundwater
Levels Web
Service



Groundwater Site Types

Well

Collector or Ranney type well
Extensometer well
Hyporheic-zone well
Interconnected wells
Multiple wells
Test hole

Agency Code:



Minimum site altitude in feet:



Maximum site altitude in feet:

Well has a minimum depth in feet of:



Well has a maximum depth in feet of:

Hole has a minimum depth in feet of:



Hole has a maximum depth in feet of:

Sites contained within these national aquifer codes:



Sites contained within these local aquifer codes:



The Future

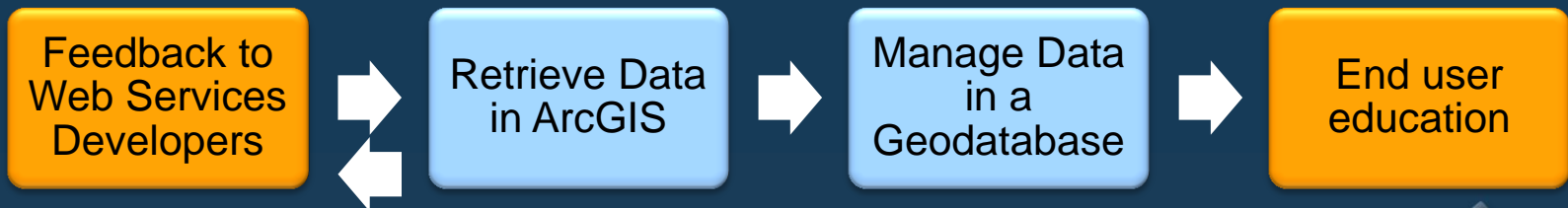
- Transform to a **web-based** application
- Inclusion on the **Geospatial Platform**
- Retrieve **EPA Storet** data
- Potential integration with **National Atlas stream tracer** web application
- Improve **water quality parameter search** with ontology experts
- Leverage **EGRET** data analysis R package to work with data in the Snapshot geodatabase
- Standards-compliant **metadata** generation

NWIS Web Services Snapshot for ArcGIS

Streamlines water **data retrieval** and **management** for USGS and public ArcMap users



Educates end users about the NWIS database

Serves as an example of a custom app that uses USGS web services (Source code: <http://github.com/usgs>)




Where to get the software and code

<http://txpub.usgs.gov/snapshot>



HOME | DOWNLOADS | COMMUNITY | HELP | TESTING

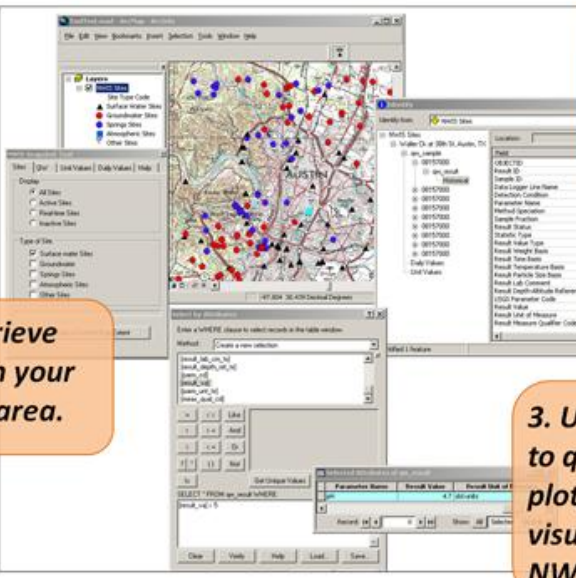
 **NWIS Snapshot**

What is the NWIS Snapshot?

The NWIS Geodatabase Snapshot Tool gives ArcGIS users the ability to query NWIS web services and download a “snapshot” of NWIS data from the web services to a geodatabase.

The geodatabase, provided with the Snapshot Tool installation files, has built-in relationships between sites and measurements taken at each site so users can run powerful queries, import tables and build new relationships with the NWIS data, and edit the data while maintaining the built-in relationships.

1. Retrieve sites in your study area.



2. Retrieve data to a relational geodatabase.

3. Use existing tools to query, analyze, plot, edit, expand, visualize, and export NWIS data.

After requesting data from the web services and populating the geodatabase, standard ArcGIS functions may then be used to visualize

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Abby Benson
Alex Dismore
Nate Booth
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John Bumgarner
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Peter Schell
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Scott Lewein
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Ken Dreyer



Contact: Sally Holl, sholl@usgs.gov

<http://txpub.usgs.gov/snapshot>